

# A NEW QUALITY MEASURE TO EVALUATE UNSTRUCTURED 2D-MESHES AND TRIANGULAR ELEMENTS: THE PERIMETRAL RATIO

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**Abstract.** Meshing can be defined as the process of breaking up a physical domain into smaller elements in order to facilitate the numerical solution of a partial differential equation. This process has been automatized through several algorithms under various computational systems to attempt the increasing “push” of meshing technology. In fact, human analysts expect to mesh complex domains constituted of thousands or even billions of elements with low level of interactions. In spite of high transparency, one difficulty arises: how to develop the necessary sensitivity to analyse the relationship between the mesh quality, in global sense, and the element quality, in local sense, with a minimum number of interactions? The objective of this paper is to provide a new quality measure to evaluate and compare both unstructured 2D-Meshes, in global sense, and their triangular elements, in local sense, called ‘perimetral ratio’ (“Relação Perimetral – RP”). This concept introduces five propositions and a virtual element of comparison, called ‘equivalent ideal triangle (“Triângulo Ideal Equivalente – TIE”)). Its functionality becomes clear through a simple and didactic two dimensional meshing web application, that permits the evaluation of a given mesh, or a set of meshes, offering a measure of global quality and a respective metric for each one of the elements. The authors hope to contribute to the understanding of the meshing process and to its relevance in numerical solution. The web application was designed in an object oriented fashion using Java Language, in order to increase the access and to facilitate the ability for meshing construction and analysis. To demonstrate the process and the application capabilities, a set of Lake Superior’s meshes, that was generated by the Delaunay Refinement process, are measured.

**Key words:** Meshing, Mesh Quality, Quality Measure, Web Application.